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POPULAR AND PRACTICAL ENTOMOLOGY

BEETLES INJURIOUS TO SUNFLOWERS IN MANITOBA

BY NORMAN CRIDDLE,

Dominion Entomological Laboratory, Treesbank, Man.

It is one of the misfortunes of farming in a new country that the breaking up of the virgin sod has a detrimental effect upon the farmer's friends such as wild birds, while it encourages previously harmless insects to become farm pests. The breaking up of the sod naturally forces ground-loving birds to seek nesting sites elsewhere, while the planting of crops provides certain insects with an abundance of new food thus enabling them to multiply far beyond the bounds that were previously possible. We have examples of this in cutworms, grasshoppers and the Western Wheat-stem Sawfly which were brought into prominence through the growing of cereals. Newly introduced crops are always apt to encourage the spread of native insects that feed upon allied plants and for that reason the entomologist finds it desirable to study the life-habits of most native insects in order to be prepared should they spread to cultivated crops.

The recent adaption of sunflowers for fodder purposes has provided another instance in which hitherto harmless insects may be turned into pests. There are a number of wild sunflowers in Canada some of which are closely allied to the cultivated kinds and since the wild species have their insect enemies there is no reason why these should not spread to those under cultivation and so become of economic importance. Notes relating to several of these insects have been made from time to time some of which are now put together in order that sunflower growers may recognize the commoner beetles found attacking the plants involved.

The Sunflower-leaf Beetle (*Calligrapha exclamationis*).

This is a common and widespread beetle in Manitoba where it is found feeding upon the leaves of various species of wild sunflower. It appears to be exclusively a sunflower feeder and for that reason promises to become one of the most important insects affecting these plants. The beetle has already spread to cultivated sunflowers where it breeds as readily as it does upon wild kinds. The life-history of this insect, as worked out at the laboratory under field conditions, is given, with a description, below:

Eggs—The eggs are elongate-cylindrical about three times as long as wide and slightly tapering towards one end. They are moderately densely punctate so that spaces between the punctures form a net-like surface. Colour dull white or greenish turning to orange before hatching.

The eggs are deposited singly but frequently in rows of irregular formation. They are placed on the stems usually in natural grooves when such are

present, but they may also be found on the underside of leaves though in lesser numbers. Egg laying extends over a period of two or more weeks and it is probable that at least 200 eggs are deposited by a single female. In captivity one beetle laid 116 eggs but it is believed that she had deposited a number before being captured.

Larvae—The larvæ are pear-shaped, the head being the narrow end. They are smooth above with numerous transverse ridges terminating near the sides close to the spiracles and bordered below by a prominent, wrinkled, lateral fold and a less conspicuous one beneath it. Underside flattish containing numerous fine, short hairs; anal extremity prolonged forming a bifid process which aids locomotion. Legs well developed black at tips. Colour of head light brown with white hairs, body pale yellowish.

The larvæ are hump-backed when crawling. They are usually found clustered around the crown of the plant where they feed upon the newly forming leaves.

Pupae—Pupation takes place beneath the ground not far removed from the plants upon which the larvæ have fed.

Adult—Superficially resembling the Colorado Potato beetle but considerably smaller. Head reddish-brown; thorax in front and at sides pale cream, basal portion with a brown area extending from the sides at base in the form of a half circle; elytra pale cream with three narrow black stripes on each side extending almost to apex and a fourth branching from the third at base extending almost a third of the elytral length, with a dot behind it thus forming the exclamation mark from which the beetle gets its scientific name. Abdomen beneath black, thorax, legs and antennæ reddish.

Beetles appear from hibernation in June; eggs are laid late in the month the ovipositing period extending into July. Larvæ are present throughout the last named month and pupation takes place at various periods towards the end of it.

Both beetles and larvæ feed upon the leaves of sunflowers. In nature they are most frequently met with on perennial species such as *Helianthus giganteus* though they have been noted in numbers upon *H. annua petiolaris* also and from these have spread to cultivated species. There is but one generation of the insect in Manitoba.

Sprays similar to those used for potato beetles are quite effective against the Sunflower beetle.

The Sunflower-pith Beetle (*Mordellistina pustulata* Melsh.)

The larvæ of this beetle were first collected in the stems of Red-root Pigweed, *Amaranthus retroflexus*, which had prematurely died. Later my brother, Evelyn, discovered them hibernating in sunflower stems some of which they had severely riddled with their tunnels. The larvæ confine themselves largely to the pith but also injure the more woody parts; they occur most frequently near the base of the plant though any portion of the stem may be infested. Plants so injured present a stunted appearance and at times die outright.

Larva—The larva is a yellowish object with black jaws. It is easily recognized by the twelve prominent protuberances on the back of the middle

segments which look not unlike prolegs and which are used for locomotion. Several larvæ may infest a single stem and these remain within the plant until the following spring when they pupate and give rise to the beetles in June.

Adult—The adults are semi-wedge-shaped beetles, black with irregular patches of pale silky hairs. There are many species of *Mordellestina* all very similar in general appearance and for that reason no effort is made to describe the one referred to above. Most of the species are found upon flowers and they skip flea-like when disturbed.

In addition to the beetles mentioned above, a weevil, *Desmoris constrictus* Say, is found feeding upon the blossoms of sunflower in some numbers, but whether it will become of economic importance remains to be seen.

IPS PINI SAY AS A PRIMARY PEST OF JACK PINE

BY S. A. GRAHAM,

Division of Entomology, University of Minnesota.

Although it has been generally established that *Ips pini* Say is normally a secondary insect and usually attacks only dead or dying trees, it is not uncommon to find statements in entomological literature to the effect that this insect is occasionally able to attack and kill healthy living trees. Such cases are, however, so very rare that an interesting occurrence of this sort which was observed in Itasca Park, during the summer of 1921, seems worthy of record.

The trees killed were young, rapidly growing Jack pine, *Pinus divaricata*, varying from two and one half to five inches in diameter on the stump, and healthy Norway pine, *Pinus resinosa* saplings; about fifteen years old. That these trees were in excellent health up to the time of attack was indicated by the fact that there was no slowing up of the growth previous to the attack of the beetles. The trees killed totaled ten in number, seven jack pines and three Norway pine saplings.

Each tree was very heavily infested from the surface of the ground almost to the top. The infestation was so heavy that there was not sufficient bark area available for the development of all the young brood, there being from ten to twenty nuptial chambers to the square foot of bark surface.

These trees were all infested by the first brood beetles, and must have been attacked simultaneously by a large swarm of the insects. Apparently the attack was concentrated upon the few trees killed since a careful examination of surrounding pines failed to show any signs that other trees had been attacked. Why the swarm should have concentrated upon these few trees is hard to understand as there was no apparent difference in situation, rate of growth, or any other factor which might explain the preference shown for these particular individuals.

Apparently the beetles were attracted to the place by the presence of two freshly cut pines. These fallen trees were very heavily infested with *Ips pini*. What probably happened was this. A large swarm of these beetles was attracted to the fresh logs. More beetles collected at the spot than could find

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room in the fallen trees and therefore chose to enter the neighboring standing trees. Inasmuch as there was an abundance of fresh pine slash within a few hundred yards of the place it is rather remarkable that the beetles did not make their way to, and infest, these piles.

Another interesting feature was the fact that this small group of heavily infested standing trees was found by woodpeckers and a very large percentage of the developing brood and adults of the insects was destroyed. It is estimated that at least 90 per cent. of all the insects in the trees, both adult and larvæ, were destroyed by these birds. The occurrence illustrates well the part that these useful birds often play in the economy of the forest. It is not at all improbable that this small infestation might have spread and served as the nucleus for a considerable outbreak if it had not been for the timely arrival of the woodpeckers.

Although the cut trees, lying on the ground, which we have assumed were the bait attracting the swarm of beetles to the infested trees, were just as heavily infested as the standing trees, it is interesting to observe that the woodpeckers did not work at all on these trees. The birds apparently were not interested in trees lying on the ground.

The preceding account illustrates well the fact that considerable care must be exercised in the use of trap trees for the control of bark-beetles. The trap tree method of control has often been recommended and applied in Europe and, since American forest entomologists have had a tendency to adopt European methods of insect control as far as possible, the practice has frequently been recommended in this country. The theory is that the insects can be attracted to freshly deadened trees called trap trees. After these traps have been infested they can be destroyed thus materially reducing the number of insects in the forest. The presence of newly killed trees about freshly cut logs emphasizes the fact that, since trap trees apparently have a tendency to concentrate the beetles they must therefore be used only with the greatest caution.

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SYNONYMIC NOTES ON CATOCALA SPECIES.

BY J. H. MCDUNNOUGH,

Entomological Branch, Dept. of Agriculture, Ottawa.

In the Archiv fur Naturgeschichte 79 A (8), p. 64, 1914, Dr. E. Strand has seen fit to apply names to all the unnamed aberrations mentioned by Hampson in Volume XII of the Catalogue of the Lepidoptera Phalaenae of the British Museum.

As a certain proportion of these names relates to North American species and as the synonymy was not dealt with in Illustrations of North American species of the Genus *Catocala,* Barnes & McDunnough, 1917, the following notes may prove of interest.

C. insolabilis ab. *insolabilella* Strand. Based on Hampson's ab. 1 "♀ smaller, 66 mm.; the head, thorax and forewing much browner." The form in question cannot be satisfactorily determined without an examination of the British Museum specimen.

C. innubens ab. *innubenta* Strand. Based on the normal ♀; falls in any case to *hinda* Fch.

C. subnata ab. *subnatana* Strand. Based on the normal ♀, with black streak below cell. The name should be dropped.

C. neogama ab. *arizonae* Strand. Hampson's ab. 3. "Hind wing with the terminal band interrupted.—Arizona." Probably referable to *euphemia* Beut. which was not known to Hampson in nature.

C. electilis ab. *electilella* Strand. Ab. 1. "Fore wing without the black medial shade." Unknown to me. Probably based on a Mexican specimen.

C. briseis ab. *briseana* Strand. Ab. 1. "Fore wing with a patch before the angle of postmedial line and the postmedial area except at costa and inner margin nearly pure white."

This form is in distinction, according to Hampson, to the typical form, in which the postmedial area is rufous except at costa and inner margin. The greater or less amount of whitish scaling on this portion of the wing is very variable and often depends on the condition of the specimen, worn specimens being much whiter than fresh ones.

C. junctura ab. *arizonensis* Strand. Ab. 3. "Fore wing more variegated with white especially on costal half of inner area and on postmedial and terminal areas except towards inner margin.—Arizona."

C. junctura ab. *juncturana* Strand. Ab. 4. "Fore wing with the basal area and the inner area to subterminal line suffused with fuscous black.—Arizona."

C. junctura ab. *juncturella* Strand. Ab. 5. "Fore wing wholly suffused with black to the subterminal line.—Arizona."

The status of the above three aberrations cannot be definitely determined without an examination of the British Museum specimens. The first one is probably a form of *arizonae* which Hampson incorrectly treats as Ab. 2 of *junctura;* the last two may very readily prove to be forms of *aspasia* with black shading, such as is found in *sara* Fch.

C. ilia ab. *iliana* Strand. This name, based on specimens with white reniform, falls to *conspicua* Worth.

C. gracilis ab. *tela* Strand. Based on specimens with dark shade along inner margin. This is in reality the typical form and Strand's name falls

MISCELLANEOUS NOTES ON COLEOPTERA

BY A. B. CHAMPLAIN AND J. N. KNULL,
Bureau of Plant Industry, Harrisburg, Pa.

The following miscellaneous notes on Coleoptera present facts and records that have accumulated in our file from rearings and field observations, made by the authors, or by others to whom due credit is given. Records without dates refer to material caged and reared in the laboratory.

LYMEXYLIDAE

Hylecoetus lugubris Say. Infests dying *Populus grandidentata* at Lyme, Connecticut. These tall poplars about seventy-five feet high with branches and foliage near the top were in deep woods. The dying trees are infested with *Hylecoetus lugubris* which overwinter in the larval stage in transverse galleries or mines in the sapwood. The larvae were very plentiful at the base, and up the main trunk twenty-five to thirty-five feet. The larvae are lemon yellow in color, armed with a caudal spine, and range in size up to twenty millimeters in length. The emergence hole is made leading from the main gallery by the larvae in the fall. Larvae, pupae and first adults were found in their cells in the sapwood on April 25. Adults taken flying on May 4.

Melittomma sericeum Harris. The adults of this interesting species are nocturnal. During the hot summer nights they may be found on the outer bark of dead oaks. Our specimens were taken at Harrisburg, Pa., June 26; July 6 and 23.

BUPRESTIDAE

Polycesta angulosa Duv. Found breeding in the heart-wood of dead *Coccolobis laurifolia* at Miami, Fla. Mature adults were chopped from their pupal cells on April 12.

Actenodes bellula Mann. A mature adult was chopped from the sapwood of a dead cypress (*Taxodium distichum*) at Paradise Key, Fla., on April 15. Adults were numerous on fire-killed *Lysiloma latisiliqua,* on the same date.

MELANDRYIDAE

Orchesia castanea Melsh. Hummelstown, Pa. Adults reared from dead water-soaked, down, elm limb.

Rushia longula (Lec.) Hunter's Run, Pa. Reared from *Pinus rigida.* Larvae work in sapwood of dead standing tree.

Enchodes sericea Hald. Rockville, Pa. Reared from partly decayed stump of *Liriodendron tulipifera.*

Serropalpus barbatus (Schall.) Throughout the Eastern United States this species lives in dying hemlock (*Tsuga canadensis*); in the western area it is found in other conifers, including *Abies.*

Dircaea quadrimaculata (Say). Hummelstown, Pa. Reared from dead decayed wood of *Liriodendron, Rhus, Salix,*—H. B. Kirk.

Phloeotrya voudoueri Muls. Rockville, Pa. Reared from dead, decayed *Betula lenta,*—H. B. Kirk.

ANOBIIDAE

Eucrada humeralis (Melsh.) Westbury, N. Y. Adults common on dying white oak.

Oligomerus obtusus Lec. Identified by H. C. Fall, Harrisburg, Pa., April, May, June, July, reared from *Fagus americana.*

Trichodesma klagesi Fall. Lyme, Conn. Reared from dead, dry stems of *Benzoin aestivale.*

Trichodesma gibbosa (Say). Harrisburg, Pa. Reared from *Hicoria,* and sour gum (*Nyssa sylvatica*) Marsh.

Trypopitys sericeus (Say). Identified by H. C. Fall, Inglenook, Pa. Reared from dead, hard, dry *Kalmia latifolia.*

Xyletinus harrisi Fall. Harrisburg, Pa. Reared from dead oak, July 12.

Xyletinus sp. near *X. fuscatus* Lec. and *X. lugubris* Lec. Harrisburg, Pa. Reared from dead, soft branches of *Tilia americana.*

Ptilinus ruficornis Say. Hummelstown, Pa. Reared from dead, dry branches of *Acer rubrum* in May. Carroltown, Pa., June 20, specimens submitted from correspondent who stated that they work in the floor of his house, eating the wood as they go.

BOSTRICHIDAE

Lichenophanes truncaticollis (Lec.) Harrisburg, Pa. Reared from dead, dry, hard limb of *Fraxinus.*

BRENTIDAE

Brentus anchorago (L.) Found beneath the bark of gumbo limbo (*Simaruba glauca*) at Miami, Fla.—DeLong and Knull.

PLATYSTOMIDAE

Ormiscus saltator Lec. Hummelstown, Pa. Reared from dead, dry, limb of *Acer rubrum.*

Eusphyrus walshi Lec. Identified by H. C. Fall, Harrisburg, Pa. Reared from dead twigs of *Rhus hirta,* also dead twigs of *Robinia pseudacacia* and *Hicoria.*

Allandrus bifasciatus Lec. Harrisburg, Pa. Reared from dead branches of *Tilia americana.* The larvae occur in the outer bark of branches lying on the ground.

CURCULIONIDAE

Hormorus undulatus (Uhler). In a previous article, entitled "Notes on Coleoptera in Pennsylvania, New York and Connecticut,"[1] this species is recorded as feeding in the adult stage on the leaves of Solomon's seal. At New Bloomfield, Pa., October 7, 1921, the work on the foliage of Solomon's seal was very evident, although no adults were present. The roots of the plant were then investigated. Here the larvae were found, working externally on the tubers, chewing out large sections in their feeding operations.

The insect probably overwinters in the larval stage, and transforms and emerges in May.

Otidocephalus myrmex (Hbst.) The previous notes[1] on this species were made during the winter months, and under artificial conditions. Since that time observations have been made out of doors through June. The adults appear in numbers at Harrisburg, Pa., about June 2. After this time adults

[1]Entomological News, Vol. xxxii (1921).

may be found in abundance on the branches of the sycamore, and on almost every leaf. In addition to eating the pustules of sycamore blight (*Gnomonia veneta*), they attack the leaf tissue, especially the midrib, where they chew out holes and sections which disfigure the leaves, and leave scars by which diseases may enter. After feeding, the adults oviposit in the stems, which have been newly killed by the blight. *Leiopus alpha* Say[1] mentioned in connection with *O. myrmex* is found in the adult stage at the same time. It confines itself to the dead and dying stems where it feeds exclusively on the blight pustules.

Magdalis pandura Say. Linglestown, Pa., June 14. Lemoyne, Pa. Reared May 3 from walnut—Kirk and Champlain.

Cylindrocopturus binotatus (Lec.) This species is very common at Harrisburg, Pa. It attacks weakened and possibly healthy staghorn sumac (*Rhus hirta*). It seems to prefer trees that have reached maturity and breeds in the sapwood on the main stem and branches.

Apteromechus ferratus (Say). Inglenook, Pa. Breeds in outer corky bark of sassafras, and does considerable damage; in fact, there was evidence enough to show that many trees had been killed. Adults emerge during July. Larvae in outer bark and sapwood.

STUDIES ON THE TAXONOMY AND BIOLOGY OF THE TARSONEMID MITES, TOGETHER WITH A NOTE ON THE TRANSFORMATIONS OF ACARAPIS (TARSONEMUS) WOODI RENNIE. (ACARINA)

BY H. E. EWING,

U.S. Department of Agriculture.

In the last few years frequent inquiries have been received from American entomologists in regard to the identity and habits of the Tarsonemid Mites. In response to these it has been found necessary to do some research upon these interesting and economically important acarids. It was thought at one time advisable to work out a synopsis of the American species or possibly even a monograph of them. A more serious reflection, however, showed that such an attempt at this time would be premature and ill-advised. Hence, in response largely to these inquiries I am here presenting certain additions to our knowledge of the Tarsonemid mites.

The Classification of the Tarsonemid Mites.

For many years all the species of this group were included in a single family, the Tarsonemidae. In my classification of the families and higher groups of the Acarina[1] in 1913 two families were recognized. To these should be added the family Disparipedidae of Paoli; and the long recognized and peculiarly degenerate genus *Podapolipus* of Rovelli and Grassi certainly should be accredited with family rank. The most of the genera and these four suggested families are arranged as follows, the more generalized groups being given first:

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[1]Ewing, H. E. New Acarina, Part 1 etc. Bul. Am. Mus. Nat. Hist., Vol. xxxii, pp. 93—121, text figs. 1—9, Pls. vii—viii.

THE CLASSIFICATION OF THE FAMILIES AND GENERA OF TARSONEMOIDEA.

A. Both sexes provided with four pairs of funtional legs.

B. Females with elongate bodies; capitulum and first two pairs of legs not covered by any projecting cephalothoracic shield.

C. Posterior legs of female each ending in a pair of claws and caruncle. Species usually ovoviviparous.....*Pediculoididae.*

D. Female with a large capitulum, showing a rostrum and rudimentary palpi; segments of abdomen distinct.

E. Larval stage represented by octopod deutovum stage; gravid female with only the tip of abdominal wall swollen .....*Pediculoides* Tar.-Tpz.

EE. Larval stage normal; most of the dorsal wall of abdomen distended in gravid female.....*Pediculopsis* Reuter.

DD. Female with capitulum reduced to a cephalic papilla, and abdomen indistinctly segmented.....*Pigmephorus* Kram.

CC. Posterior legs of female devoid of claws and caruncle. Species oviparous.....*Tarsonemidae.*

D. Female with pseudostigmatic organs and very slender posterior pair of legs, which in the male are somewhat enlarged .....*Tarsonemus* C. & F.

DD. Female without pseudostigmatic organs and with short, stumpy fourth pair of legs, which in the male are reduced. .....*Acarapis* Hirst.

BB. Females with subdiscoidal bodies; capitulum and first two pairs of legs covered by the projecting cephalothoracic shield.....*Disparipedidae.*

C. Females with posterior legs each composed of five segments and provided with a pair of claws and caruncle.

D. Anterior legs of female each provided with a claw.

E. Segments IV and V of leg IV of female exceedingly slender, cylindrical and subcapillary.....*Imparipes* Berl.

EE. Segments IV and V of leg IV of female short, stout, and V never cylindrical.....*Pygmodispus* Paoli.

DD. Anterior legs of female clawless.....*Diversipes* Berl.

CC. Females with leg IV composed of four segments and without claws and caruncle.

D. Anterior legs of female each provided with a claw .....*Disparipes* Mich.

DD. Anterior legs of female clawless.....*Variatipes* Paoli.

AA. Males hexapod; females in their final stage legless.....*Podapolipidae.*

Contains the singular, degenerate genus.....*Podapolipus* Rov. & Gr.

The best known and probably the most important economically of all the genera of the Tarsonemoidea is the genus *Tarsonemus.* The females in this genus are so nearly alike that no specific characters for their separation have yet been found. The males, however, can be easily distinguished. A key is here given to the males of eleven species:

KEY TO MALES OF TARSONEMUS.

A. Posterior legs with hyaline leaf-like expansions.

B. Each hyaline expansion arising from inner central aspect of large second segment of leg.....*T. spirifex* Mar.

BB. Each hyaline expansion arising from inner distal aspect of large second segment of leg.

C. Second segment of leg IV swollen externally near its base.

D. Large latero-ventral spine of second segment of leg IV situated near the middle of segment.....*T. kirchnerii* (Kr.).

DD. Large latero-ventral spine of second segment of leg IV situated almost at distal end of segment.....*T. pallidus* Bks.

CC. Second segment of leg IV not swollen near base.*T. spinipes* Hirst.

AA. Posterior legs without hyaline expansions.

B. Each posterior leg ending in a conspicuous claw.

C. Claw toothed near its base.

D. Body much over one-half as broad as long.*T. floricolus* C. & F.

DD. Body not over one-half as broad as long..*T. brevipes* S. & L.

CC. Claws without tooth.

D. Large second segment of posterior leg with a spur, or tooth-like expansion on inside toward base.....*T. anamas* Tyr.

DD. Large second segment of posterior leg without spur-like expansion on inside.

E. Third segment of posterior leg broader than long.

F. Claw of leg IV about twice as long as distal segment .....*T. chianaspivorus* Ewing.

FF. Claw of leg IV not longer than distal segment .....*T. approximatus* Bks.

EE. Third segment of leg IV twice as long as broad .....*T. waitei* Bks.

BB. Claw of posterior leg reduced to a small tubercle, legs themselves very long.....*T. latus* Banks.

The Mouth-parts in the Tarsonemoidea.

The mouth-parts in the Tarsonemid mites have become consolidated to a great extent and reduced in number of segments and sclerites, and are borne by a clearly differentiated anterior region of the cephalothorax, that should be designated as the capitulum. The degree of reduction in parts and of their consolidation varies in the different species and genera.

In *Tarsonemus pallidus* Banks and in the genus *Tarsonemus* the capitulum is large and conspicuous. In this species the palpi are reduced and fused to a large extent with the capitulum yet segmentation is noted. The chelicerae are represented by a pair of needle-like structures.

In *Pediculoides ventricosus* Newport the mouth-parts are lodged in a large capitulum. The chelicerae are slender and needle-like, or setiform. The palpi are much reduced, and only a single segment is evident, which is free.

In *Pediculopsis graminum* (Reuter) the capitulum of the female is large, the chelicerae are serrate and adapted for piercing but are hardly needle-like. In this species, according to Reuter, the palpi of the female are very minute structures with two free segments. In the male the chelicerae are apparently wanting, and the palpi are represented by a single free segment. Furthermore, the capitulum in *Pediculopsis* is distinctly papilliform.

In the genus *Pigmephorus* and in all the Disparipedidae the capitulum is reduced in size and is papilliform. The mouth-parts in these groups are not necessarily equally reduced. In *Pigmephorus americanus* Banks the palpi, while not entirely free, are seen to be segments. The palpi in the Disparipedidæ show various degrees of degeneration. In *Imparipes hystricinus* Berlese, according to a figure by Paoli, the palpi have four free segments. I have examined an American species of this genus, *I. texanus* (Ckll.). It has rather long, free, laterally-situated palpi, but I can only make out three free segments

Food Plants of Tarsonemus Pallidus Banks.

The cyclamen mite, *Tarsonemus pallidus* Banks, is of late becoming of more economic importance. Moznette[2] (1917) gave three food plants for this species, which were in the rank of relative importance as follows: cyclamen, chrysanthemum and snapdragon. Records are here given for the National Museum specimens: Types from chrysanthemum, Jamaica, N. Y., by Serrine; specimens from snapdragon, Bala, Pa.; from verbena, Bloomsburg, Pa.; from cyclamen, Ithaca, N. Y., by Crosby; from cyclamen, New York City, by H. S. Adams; from cyclamen, Nahant, Mass., by T. Roland; on snapdragon, New Haven, Conn., by S. T. Bradley; on cyclamen, Hartford, Conn., by Q. S. Lowry; on geranium, Whitmarsh, Md, by Sasscer; on cyclamen, Washington, D.C.; on (?), Washington, D. C. (Number on slide is 6751); on heliotrope, Ottawa. Canada, by Fletcher.

The Feeding Habits of Pediculoides Ventricosus Newport.

Pediculoides ventricosus is well known to many entomologists because of its attack on living insects. Dr. Howard has called attention particularly to its attacks on Hymenopterous parasites. This species is the one supposed to have had a disastrous effect upon the Chalcid, *Scutellista cyanea,* at a time when it was hoped that this Hymenopteron would effectively parasitize the black scale. During the past year the writer has had this species under observation, and has noted especially its food habits.

The statement has been made that the adults upon emergence feed upon the body of the female that gave them birth. These statements are undoubtedly true for the adults were repeatedly observed under the binoculars to insert their chelicerae and feed from the juices of the gravid and frequently dead females. Males were observed to feed almost entirely upon the body of their pregnant mother. This type of parasitism might be called autophagous.

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[2]Moznette, G. F. The Cyclamen Mite. Jour Agr. Research, Vol. x, No. 8, pp. 373—390, text figs. 1—6, Pls. ii—iii.

Scavenger Habits: That the females of this species (Fig. 1) may live entirely as scavengers was established by the following observation. Late in October, 1921, Mr. Bridwell, of the Bureau of Entomology, gave to the writer a dead Hymenopterous larva inclosed in a small breeding cell that had attached to it engorging females. This larva was kept in its cell and observed daily until Nov. 25. The engorging females soon became replete and gave rise to scores of adult offspring. These second generation individuals attached to the same larva and completely concealed the latter with their distending bodies. On Nov. 25, after many adults had been removed in the meantime, the cell was found to be swarming with the third generation. Thus it was shown that the female of the species may live entirely upon the dead corpses, or in other words as scavengers.

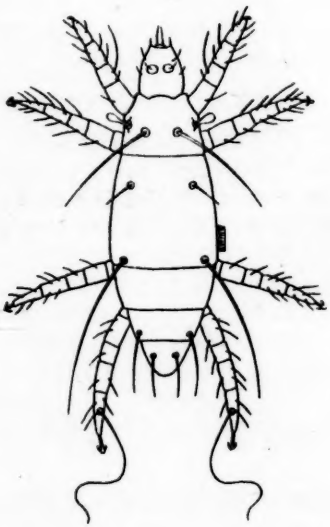

Fig. 1. *Pediculoides ventricosus*, female. (Original).

The Attacks on Man: Experimental observations made to ascertain the nature of attacks on man. Large numbers of the mites were placed; *a.*, on the upper side of the forearm, *b.*, on the side of the body, *c.*, on the tender skin inside of the bend of the elbow. In each of these cases the application ot the mites to the skin was followed by a burning sensation. There was but little itching at this time and this burning sensation soon subsided. The appearance of reddened spots, each with a small papule in the centre, was noted the day following application. These spots usually did not develop into wheals but did itch considerably. Within three days the papules were greatly reduced in size and the itching had subsided.

Do the Mites Enter Hair-follicles? On Nov. 5, females were placed on the skin separately and observed continually under the binocular for many minutes. None of these individuals entered the follicles although they were observed to occasionally investigate the mouths of the same. The width of the

female, about 0.12 mm., is greater than that of the unfilled space of most of the hair-follicles. In the case of empty follicles resulting from hair detachment, the mites are small enough to enter. The only way the mites were observed to injure man was by pricking the skin with their chelicerae. The mites never attached permanently or engorged as chiggers do.

Is Itching Due to Crushing of Mites? At 10.30 a.m. one morning many specimens in all stages were crushed on the back of the forearm. Not the least itching or injury developed. It appears, therefore, that the dermatitis that this mite causes, does not come from the crushing of the mites themselves. Just to what it is due cannot be stated at present, but the great delay in the appearance of the papules would indicate that these were not caused by the injection of a toxin.

The Transformations of Acarapis Woodi (Rennie).

Recently the writer has received from Mr. Hirst, of the British Museum, a slide of specimens of *Acarapis woodi* (Rennie), and also has had an opportunity of obtaining some live material through Mr. A. P. Sturtevant, of the Bee Culture Laboratory of the U. S. Bureau of Entomology, which material came originally from Scotland. While it is not at all the intention of the writer to make a special study of this serious parasite of the honey bee, yet it is deemed advisable to compare its different instars with those given for some of our other Tarsonemid species.

Rennie in his interesting and highly important article, "Isle of Wight Disease in Hive Bees—Acarine Disease: The Organism associated with the Disease—Tarsonemus woodi, n. sp.," gives descriptions of the following stages of the Tarsonemid of the honey bee: Ovum, larva, immature female, adult male, adult female. The "so-called" immature female is referred to in one place in Rennie's paper as the female nymph.

In the European material received the present writer does not find any such immature female, but does find a nymphal stage,—a peculiar apodous nymphal stage,— that precedes what Rennie calls the immature female. This nymph is quiescent and never is found outside of the cast larval skin.

Description of Apodous Nymph of Acarapis woodi (Rennie).

One of these apodous nymphs was dissected until it was very largely free from the containing cast larval skin, and another has been found in which the old larval skin has been almost entirely torn away in mounting. A description of the nymphal instar follows:

Apodous Nymph (Fig. 2): When first formed, oval; dimensions and general shape similar to that of engorged and quiescent larva. No legs, no mouth-parts, or any other appendages. Integument well formed, as thick as that of the larva; under low power appearing smooth but under high power seen to be minutely and indistinctly striated. Older nymphs showing, at first distinctly and later plainly, the formation of adult. Adult formed in a manner similar to that of *Pediculoides ventricosus*, the legs and chelicerae appearing first

as minute buds, which later elongate, and finally become segmented. The apodous stage is one of almost complete histolysis followed by the reformation into the adult state. Length of apodous nymph, 0.11 mm.; width, 0.06 mm.

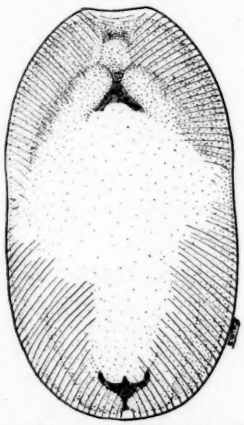

Fig. 2. Apodous nymph of *Acarapis woodi* (Rennie). Ventral view, x600. (Original).

This nymph is homologous with the apodous intrauterine nymph described by Brucker for *Pediculoides ventricosus* and with the extrauterine nymph described by Reuter for *Pediculopsis graminum*. The apodous nymph is very similar physiologically, ontogenetically and morphologically with the pupal stage of most dipterous insects. It represents undoubtedly the nymphal stage of other mites and is in fact a degeneratively and highly specialized nymph.

The Females of Acarapis Woodi (Rennie).

Rennie describes two stages for the female, the immature female and the adult female. I have failed to observe any such stages. What he figures and describes as the immature female the present writer would call the nongravid female, and what he calls the adult female (his Fig. 1) I would call the gravid female, or the ovigerous female,—the latter term having also been applied by Rennie in his formal description. These differences in the female are not fundamental, but are found in all mites, and do not represent differences due to the presence of different instars.

The Eggs of Acarapis woodi (Rennie).

The enormous size of the egg of *A. woodi* greatly impressed the writer in regard to its possible significance. A part of this significance is explained by the finding of a quiescent nymphal stage. Taking no nourishment itself this nymph must have handed on to it an added supply of potential energy. Having to supply this added energy, the larva profits greatly by receiving an added amount at time of hatching, which it gets in the form of a great amount of egg substance, which transformed into a larva produces one already almost as big as it ever gets. Rennie's figures for the dimensions of the egg are: Length, 0.14 mm.; breadth, 0.06 mm. The averages for six eggs measured by the writer are: Length, 0.127 mm.; breadth, 0.067 mm. The figures compare favorably.

The Transformations of Tarsonemid Mites.

In order to help clarify the whole matter of transformations in the Tarsonemidae a comparative study has been made of four species. The transformations of two of these have been so well worked out by two European workers, that in these two cases little will be done except to quote from their results. I have checked up both of these workers by personal studies of the species concerned.

Brucker[3] (1900) has worked out the development of *P. ventricosus* and finds that all stages are passed inside of the uterus of the female, the new and fully formed adult males and females hatching from the egg skin. The first stage of the embryo, according to Brucker, is an octopod stage with segmented appendages. Following the development of the octopod embryo, the segmental appendages become reduced in size, particularly the fourth pair of leg buds; and are curved against the ventral surface of the embryo. Brucker refers to this stage as "l'etat hexapode," notwithstanding it has eight leg appendages. Following the second embryonic stage, the substance of the appendages is absorbed and an apodous stage is reached. This stage is called the apodous pupal stage by Brucker. From this stage the adult emerges.

Reuter finds in *Pediculopsis graminum* Reuter that an octopod embryo first develops and is followed by a hexapod stage in which the fourth pair of leg buds disappear. This is the larva and is the first free-living stage. Later there forms inside of the larval stage a new skin, but with it no appendages develop. This skin Reuter calls the "apoderma" stating that it is the rudimental nymphal skin. The nymphal stage, therefore, is incomplete and is passed inside of the larval skin. From this apodous nymphal instar the adults are formed.

In this country Moznette has worked on the life history of *Tarsonemus pallidus* Banks. He made the important discovery that no free-living nymph exists. He gives the following instars, or stages, for this species: egg, larva, quiescent larva, adults. Speaking of the transformations of this species he states: "No nymphal stage was found in this species and instead of a nymph originating from a larva, as is the case in the life history of most mites, a larva transforms to a quiescent stage, which later gives rise to the adult form." The present writer has received from Moznette a slide of *T. pallidus* in which is found a quiescent larva, within which is a fully formed adult female. I have also observed an abundance of other material of this species and find that the adult mentioned by Moznette is contained, not in the old larva skin, but in an apodous skin inside of the old larval integument. In a specimen received by Moznette a rupture of the old cast larval skin at one end of the body reveals very clearly this latter apodous instar. Further it is noted that the new legs of the first three pairs are formed, not inside of the skins of the larval legs as they are when a legged nymphal stage follows the larval stage, but inside another apodous envelope. This apodous envelope is no other than the skin of an apodous nymphal stage,

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[3]Brucker, E .A.—Monographie de *Pediculoides ventricosus* Newport et Theorie des Pieces buccales des Acarines. Theses presentées a la Faculté des Sciences des Paris, pp. 355—442, text figs. 1—12, Pls. xviii—xxi.

and it is undoubtedly the same stage as is represented by the apodous nymph of *Pediculoides ventricosus* and *P. graminum.*

When we compare the transformations of these other Tarsonemid mites with those of *T. woodi,* we can interpret those of the latter in a new light. It is observed that the transformations of *T. woodi* are similar to those of the other species here considered, although the morphology of the instars is different, and undoubtedly its life history will be found also quite different. Here is given an annotated chart illustrating by way of comparison the different instars of the four

	EGGS	LARVA	NYMPH	ADULT
Pediculoides ventricosus	Many produced; never laid; about the same size as newly emerged ♀.	Represented by octopod deutovum stage of embryo; no true larva existing.	Represented by apodous intrauterine "pupe", which is really a nymph.	Not degenerate in any way. Facultative predators, scavengers or parasites.
Pediculopsis graminum	Many produced; about two-thirds the size of newly emerged ♀.	Normal, free-living.	Represented by apodous nymph found inside of old larval skin.	Not degenerate; free, sucking juices of plants.
Tarsonemus pallidus	About one-third as large as newly emerged female; is laid.	Normal, free-living.	Represented by apodous nymph formed inside of larval skin.	Normal, not degenerate; sucks juices of plants.
Acarapis woodi	A very large egg, about the size of nongravid female; laid in tracheae of honey bee.	Free-living but degenerate. Two pairs of legs represented by stumps.	Represented by apodous ,nymph formed inside of old extra-uterine larval skin.	Parasitic (free-living?); female somewhat degenerate.

species considered, the comparable, or homologous instars being placed in vertical columns.

Degeneration and Adaptation in Parasitic Species.

In *Pediculoides ventricosus* Newport there has been apparently no degeneration, but on the contrary, in regard to reproduction at least, there has been great specialization. This specialization has brought about a tremendous increase in the fecundity of the female and is doubtless correlated with the precarious conditions that exist in regard to transferance to new hosts. Of those females that are compelled to leave their mother and search out a new host undoubtedly the vast majority must perish. It is seen that the successful female, having once reached a proper host has an abundance of food, hence she can meet the enormous drain placed upon her because of her great reproductive powers. This reproductive power which brings about the swelling of her body during pregnancy to many times its original size, incapacitates her for locomotion, but only, it is noted, after she has reached her host.

In *Acarapis woodi* degenerative changes have already been noted by Rennie in the shortening of the posterior legs. This species also shows other evidences of degeneration. The second and third pairs of legs of the larva are not only reduced, but exist practically as vestiges. These legs in the free-living species are usually equal to the front pair and are efficiently functional. The sense

organs, called pseudostigmatic organs, which are so conspicuous and characteristic of the females in the Tarsonemidae are lost in the honey bee Tarsonemid, as was noticed by Rennie. In the male there is little evidence of degeneration. The posterior legs are far from being as well developed as they are in many species, yet are about as large relatively as they are in some free-living forms.

All of these degenerative changes observed in *A. woodi* are most easily explained by attributing them to adaptation to a parasitic life. Other structures also indicate a form of adaptation that the writer has found[4] to be general in the parasitic Acarina. This is the development of extraordinarily large setae. The female of *A. woodi,* not only has all the body setae well developed, but two of these located on each of the stumpy, degenerate hind legs are enormous, and in length are about equal to the total length of the body. In regard to the male of *A. woodi* but little specialization is seen in this respect.

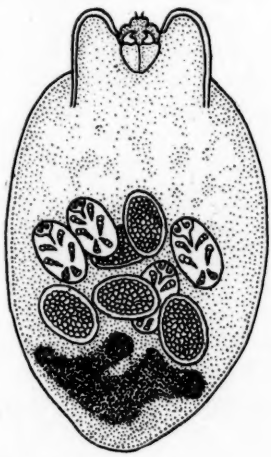

Fig. 3. Ventral view of adult female of *Podapolipus reconditus* R. & G. (After Rovelli and Grassi).

In the parasitic family Disparipedidae both degeneration and adaptation are pronounced. Of the degenerative changes the most pronounced is the shortening of the legs. These may be reduced to mere stumps. It is particularly interesting to note that in this parasitic family the stumpy posterior legs of the female almost invariably have enormous setae as has been observed in the female of *A. woodi.*

The limit of degeneration in the Tarsonemidae, and for that matter for all the Acarina, is found in the genus *Podapolipus* Rovelli and Grassi. In this genus the female (Fig. 3), which is at first hexapod, upon reaching maturity is legless. The male is hexapod. These most degenerate Tarsonemids are found under the elytra of certain Old World beetles.

[4]Ewing, H. E. (1911). The Origin and Significance of Parasitism in the Acarina. Trans. Acad. Sci. St. Louis, Vol. xxi, pp. 1—70, Pls. i—vi (Particular reference, p. 52).

VENATIONAL VARIATION IN RAPHIDIA

BY NATHAN BANKS,

Cambridge, Mass.

In 1891 Albarda published a revision of this family and it has since been the standard work on the group. In this he uses various venational characters in his tables for distinguishing the species. A few years ago (1918) Navas published a monograph of the family, and gave generic names to the sections of Albarda and to some he himself separated from the typical *Raphidia*. Recently in identifying various Raphidians I went over the entire museum collection to see if the venational characters of Albarda and Navas could be utilized to advantage in our species. Having about seventy specimens of ten species of European Raphidia I tested them for these venational characters.

As to the stigma. Several European species are separated by having two veinlets in the stigma, and Navas makes a new genus, *Lesna*, for these forms. In several specimens of *R. notata* one or two wings have a stigma with but one veinlet either forked or simple. In one specimen of *R. major* three wings have a stigma with one forked vein and the other stigma with a simple vein. Both of these species normally have two veinlets in each stigma. *R. xanthostigma* normally has but one veinlet, yet in one wing of one specimen in a series of ten there are two veinlets in the stigma.

In examining several hundred American specimens I find nine specimens in which one or more wings have a stigma with two veinlets; one specimen has it in all four wings; two others have it in three wings; two others in both forewings. The position of these cross veins (as in the European specimens) is not constant. Except for these differences in the stigma, five of these specimens are *R. oblita*, two are *R. occulta*, one *R. adnixa*, and one *R. assimilis;* six are from California, one from Oregon, one from Washington, and one from New Mexico. The five specimens of *R. oblita* are not alike in minor venational characters. It is evident that this character is of no generic value, of no specific value in American specimens, and even in the European must be used with caution.

Albarda and later Navas makes much of the number of cells behind the stigma, called the discoidal cells. These are said to be either three, four or five. Three is most common in the European and four or five in the American species. The extra cells usually reach but part way back to the base of the other cells, in fact I have seen no specimens with five complete cells. In the European specimens before me three seem fairly constant for most of the species, but in *R. notata* a fourth cell of varying size is usually present.

In American specimens the number of cells is much more variable. In a series of eighty *R. oblita* about half have the second discoidal pedicellate in one or both forewings, and of varying size; sometimes extremely minute, in other cases reaching to the base of the other cells. And when it is as far back as the other cells its basal width varies from as wide as that of the other cells to a mere point. In seven specimens there is a fifth cell present in one or both forewings, of varying size; four of these are from British Columbia, three from California.

In fifty-seven specimens of *R. occulta* the extra (second) discoidal cell is present, not often complete, and sometimes very minute.

In thirty-three specimens of *R. adnixa* the extra discoidal is often pedicellate, but frequently complete; in two specimens one wing has a small fifth cell.

In sixteen *R. assimilis* there are none with five complete cells, one or two being pedicellate and sometimes very small, and in one specimen, otherwise agreeing with *assimilis,* there are but three discodidal cells in each fore wing.

In fifteen *R. astuta* four cells are normal, but the second is often pedicellate, and one with a short fifth cell in one wing.

In six specimens of *bicolor* three cells are normal; a fourth is present in varying size in three specimens. Two of the Navasian genera are for American species having four (*Glavia*) and five (*Agulla*) cells, and both distinct from the European *Raphidia* with three cells.

Since this character varies greatly within the various species it certainly is not even of specific, much less generic value.

Navas separates from *Raphidia* typical those forms having one less apical vein into a new genus *Raphidilla*, and Albarda uses a similar character, viz., whether there is a simple third apical vein. In ten specimens of *xanthostigma* this character holds, but in *notata* it varies. When however one tries to apply these characters to American Raphidias the result is nothing less than ridiculous. For of *R. oblita* and *R. occulta* nearly one-half of the specimens are not alike in the two front wings, in fact it is difficult to find a specimen in which the apical venation is even approximately alike in the two fore wings. For example, of the five specimens of *oblita* having two cross-veinlets in a stigma no two are alike in apical venation.

This character is undoubtedly more constant in the European than in the American species, but a character so variable in one part of a genus should not be used to separate another part of that genus into a distinct genus. *Raphidilla* is a synonym of *Raphidia.*

Another genus of Navas, *Subilla*, is based on two species (*schneideri* and *sericea*) with an extra cubital cell. In the two species the extra cell does not occupy the same position. *R. sericea* is only known from the two type specimens, without definite locality, and *R. schneideri* from only few examples from four widely separated countries. Hagen has suggested that *schneideri* may be but a form of *R. cognata*, and it is probable that both these species are but venational variations of some other species. On examining our material I have not found any with the extra cubital cell, but in the allied genus, *Inocellia,* the number of cubital cells varies. Two specimens of *Raphidia* (one Utah, one Idaho) have but two cubital cells in one wing. The character is surely not of generic value.

Still another genus, *Puncha,* Navas creates for *R. ratzeburgi* and *R. insularis* of Europe, on the character of three radial cells in each fore wing. This holds for the few European specimens of these species before me. In *Raphidia* there are three radial cells in the hind wing, and in *Inocellia* in both

wings. None of the American specimens examined have more than two radial cells. In one specimen of *R. ophiopsis* there is but one radial cell in one fore wing, and but two in each hind wing. Variation therefore occurs in this character. The two species included in *Puncha* are very different from each other; one has a simple third apical vein, the other not; one has a long dark stigma, the other a short pale one. It is evident that the two do not form a natural assemblage and that each is more allied to other species.

Another genus, *Alena,* Navas recognizes for two American species, which I had already separated as a section on the number of bullae in the wings. A third species, *australis,* from Lower California also goes in this section. The male genitalia of this section is very different from the other *Raphidia* and it may well be a distinct genus or subgenus.

In examining American Raphidias I have found other variations; not infrequently the end of one of the discoidal cells is lacking, and the position of all cross-veins is variable. Our species usually have the stigma beginning considerably beyond the base of the first discoidal cell, and the dividing veinlet usually arises before the middle of the stigma, but its exact position is not constant in any species. I have four *R. oblita* in which the stigma is long, and the dividing veinlet arises beyond the middle, in two of these the stigma is much darker than usual, otherwise they appear to be *R. oblita.* In *R. bicolor* based on the bicolored stigma the amount of contrast in color is variable. I have seen but two specimens of American Raphidia in which the stigma arises near base of the first discoidal cell; one of these is *oblita,* the other one has peculiar genital plates and appears to be a new species.

In *R. oblita* the stigma is rather pale, but in some specimens it is plainly darker to considerably darker. In *R. occulta* the stigma is more uniformly dark, and usually shorter than in *R. oblita.*

Navas has also divided *Inocellia* into four genera. For two of our species, *inflata* and *longicornis,* he makes a new genus, *Negha,* since both are figured as having two cells in the second cubital series, whilst *hageni* and several European species have but one such cell. This holds for the two specimens of *longicornis* before me, but in *R. inflata* it is variable.

In a series of eleven specimens from Reno, Nevada, three have two cells in the second series, while the other eight have but one cell. Most of them have the stigma long as figured for *inflata,* while three, one with one cell, two with two cells, have it short and over the cross-vein as figured for *hageni,* others have the stigma of intermediate length. Such a character is certainly not of generic importance.

His two other new genera are based on European species of which I have no specimens, but the characters are similar venational variations.

In 1867 Hagen described very briefly five species of Raphidia from Europe using genitalic characters. Most of his specimens were lost in shipping them to Albarda. There are however two still extant. Of *R. corsica* there are two heads and thoraces; these agree closely with *R. insularis* Albarda; of *R. cyprica* there is one good specimen; in Albarda's table it runs to *pontica* Albarda, and agrees with his description and figure.

NEW AND LITTLE KNOWN CANADIAN SYRPHIDAE (DIPTERA)

BY C. HOWARD CURRAN,

Orillia, Ontario.

Syrphus venustus Meigen.

This European species, evidently not heretofore recorded from North America, is rather widely distributed, and I have seen specimens from Mass., Wis., McDiarmid, Ont., and a single specimen captured at Orillia on May 30th, 1921, on bloom of *Osmorrhiza claytoni* in Fitton's woods, late in the afternoon.

In Williston's table the species would trace out to *S. amalopis* O.S., but is readily distinguished. The cheeks and a broad, almost complete, median facial stripe are shining black; eyes short whitish pilose; antennae wholly reddish, arista black. Thorax and scutellum shining aeneous black with whitish or grayish yellow pile; scutellum subtransluscent reddish-orange in some reflections, and with some black pile apically. All the abdominal bands narrowly interrupted and reaching the side margins; the first pair not arcuate, second and third pairs concave in front; all the bands rather narrow. In the specimen before me the first band does not quite reach the margin, or does so indistinctly, a common variation in this species, according to Verrall. The legs are reddish except the bases of the femora and a black ring on the hind tibiae; terminal tarsal joints brown. Verrall reports the species common in England in wooded districts in spring. I can see no differences between the American specimens and European specimens, from France.

Syrphus genualis Will.

This species proved to be moderately common this year. Between April 28th and May 25th I took 14 specimens. The earliest specimens were taken on Cowslip in marshes, later on Wild Plum, Black Cherry and Choke Cherry, and a single specimen on *Osmorrhiza claytoni*. While females predominated both sexes are represented in the series before me. The males have the abdominal bands attenuated laterally.

Syrphus cinctus Meigen.

A European species which proved to be very abundant this spring on the bloom of Wild Plum and Cherry, but not observed elsewhere. My identification has been confirmed by Prof. M. Bezzi, Turin, Italy, who compared specimens with European ones. It traces out to *S. diversipes* in Williston's table, but the thorax and scutellum are wholly pallid grayish white pilose, and the abdomen is somewhat shorter.

Brachyopa perplexa n. sp.

Most closely related to *B. notata* O. S., but arista not as pubescent and epistoma more produced. Larger than *B. media* Will., and with black abdominal markings, the median longitudinal black line practically complete.

Male. Length, 6.5 to 8.5 mm. Face and front pale yellow, thickly covered with white pollen, the cheeks and the frontal triangle, except narrowly next to the eyes, shining; a brownish or ferruginous stripe from the eyes to the oral margin; occiput below shining ferruginous, but above and near the eyes grayish

pubescent. Vertical triangle and a narrow V behind the ocelli on the occiput grayish yellow (sub-golden) pollinose, the ocellar triangle shining brown. Pile of head; a few pale hairs on the cheeks, posterior orbits with long pale pile below, and short black pile arranged in rows, on the upper half. Thorax reddish brown, the sternum more blackish, but covered with grayish pubescence; disc of the dorsum grayish pollinose, leaving four stripes of a shining dark reddish brown, or sometimes blackish; the median stripes very narrowly separated and expanded posteriorly to unite with the sub-median stripes, which are also entire; the opaque area is strictly confined to the disc. A darker, thickly black pilose stripe runs from the postalar callosities to the suture. Dorsum of thorax with short black pile, the pleura with longer white pile. Scutellum brownish yellow with short black pile, but with a few slightly longer bristle-like hairs apically. Abdomen pale yellow to luteous yellow, shining; first segment black, its anterior border yellow; second segment with a narrow median longitudinal black stripe, narrowly separated from the anterior margin, usually plainly joined to the black of the posterior margin, but sometimes only faintly so, (the median spot is ! shaped without the dot below); posterior border narrowly black, sides of segment, except anteriorly, black; third segment similar, darker colored, the longitudinal median stripe and black lateral margins entire; fourth segment similar but usually with the lateral margins more brownish. Hypopygium yellowish red. Pile of abdomen fine, whitish, except on apical half of segments two and three, where it is black. Legs reddish brown; tarsi all brown or blackish, except that the first three joints are yellow apically. Wings slightly yellowish tinged; stigma pale luteous. Squamae clear white, with white pile. Halteres slightly yellowish. In immature specimens taken in early May the abdominal markings are more brownish, and in fully mature specimens the abdomen may be slightly reddish yellow, and is always wholly shining. The thorax may be slightly darker or paler than described.

Female. Averages .5 mm. smaller than the male (the smallest male is 7 mm.); face a little more deeply excavated; front shining ferruginous with a very narrowly interrupted whitish pollinose band below the middle; stripe on cheeks faint or absent; median abdominal stripe broader, complete on segments 2 to 4 inclusive; transverse bands broader and successively narrower distally; fifth segment yellowish ferruginous with the narrow hind border blackish and the lateral margins ferruginous or brownish. The general color is more ferruginous than in the male.

Holotype, ♂, Orillia, Ont., June 2, 1921; *Allotype,* ♀, Orillia, June 2, 1921, in the Canadian National Collection, Ottawa.

Paratypes, 43 specimens, the majority males, Orillia, May 8th to June 14th, 1921, (Curran) on bloom of Choke Cherry, Black Cherry, Wild Plum, in vicinity of woods, and on bloom of *Osmorrhiza claytoni* in open sub-swampy woods.

B. perplexa differs from *notata* O.S., in the shorter pile on arista, darker thorax and abdominal markings and darker ground color of body, more produced face, as well as in the unclouded wings. From *media* Will it differs in the more reddish color, more produced face, darker abdominal markings; from

flavescens Shann. in the same respects and in the darker thorax; from *gigas* Lovett in its smaller size, less pilose arista, paler color, and in thoracal and abdominal markings. It differs from the remaining species by lacking pollen on the abdomen, except perhaps on the first segment.

Helophilus lunulatus Meigen.

This species was abundant at Cowslip at Orillia during the first week in May this year, (1921) and over 40 specimens were taken, including only three females. My dates range from April 28th to May 22nd. Other bloom on which taken were: Wild Plum, Choke and Black Cherry. It was abundant only on Cowslip.

Brachypalpus apicaudus n. sp.

Male. Length, 13 mm. Head shining black, the face and front obscured by yellowish pubescence, leaving only the cheeks shining. Face in profile retreating to below the middle, thence slightly produced to the tip of the oral margin; first antennal joint piceous, second luteous, third black, its base yellow below; arista yellow, its tip blackish. Eyes very slightly separated; frontal triangle black, with black pile in front; posterior orbits and narrow facial side margins with rather long yellowish pile. Thorax and scutellum aeneous greenish black, moderately short fulvous pilose. Abdomen greenish black, its disc with short, its margins with longer fulvous pile. Apex of fourth segment emarginate in middle, its end reddish yellow. Legs black, tips of femora, bases and tips of the tibiae and the basal three joints of the tarsi yellowish. Legs fulvous pilose except the arcuate hind tibiae which are clothed with short blackish pile. Wings slightly infuscated anteriorly; stigma pallidly yellow.

Holotype, ♂, Cranbrook, B.C., (C. B. D. Garett), in the author's collection.

This species is very closely allied to *B. inarmatus* Hunter, but the thorax is only slightly purplish, the second segment has a metallic bluish reflection and no distinct opaque spot; the legs are more yellowish and the antennae distinctly darker; the hind tibiae terminate in a stout spur.

Mailed August 4th, 1922.